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(54) Mit verringerter Viskosemenge hergestellte faserverstärkte Nahrungsmittelhüllen auf Cellulosehydratbasis

(57) Die Erfindung betrifft eine faserverstärkte, schlauchförmige Nahrungsmittelhülle auf der Basis von regenerierter Cellulose, dadurch gekennzeichnet, daß sie mit einer um 10 bis 30 % gegenüber dem Standard verminderten Menge an Viskoselösung bei einer um mindestens 25 % erhöhten Spinngeschwindigkeit hergestellt ist.

EP 0 733 306 A1

Fiber-reinforced cellulose-hydrate-bas d food casing produced with a d creased amount of viscose.

The invention relates to a fiber-reinforced, tubular food casing based on regenerated cellulose. This casing is preferably used as sausage casing.

Fiber-reinforced cellulose-hydrate-based food casings have been on the market since as early as 1933 in the USA and since 1936 in Germany and have been successively improved since then. They are generally produced by the viscose process, in which a cellulose xanthogenate solution, termed a "viscose solution", is applied to a usually tubular nonwoven fiber web. If this viscose solution is only applied to the outside, one speaks of an "outer-viscosing" (DE-A 19 65 129), while coating the outside and inside is termed "double-viscosing" (DE-A 19 65 130). The viscose-coated fibrous material is then conducted through spinning and precipitation baths, each of which contain sulfuric acid, ammonium sulfate and sodium sulfate at various concentrations. The viscose is first coagulated and cellulose hydrate is then regenerated via xanthogenic acid. The cellulose hydrate tube produced in this way is then conducted through a plurality of washing baths. The spinning speed (and correspondingly the speed at which the casing is drawn through the baths) is about 20 to 28 m/min, depending on the sausage skin spinning machine used. The cellulose hydrate casings are conventionally further treated with a secondary softener, such as glycerol, and dried.

The nonwoven fiber web (= fiber paper) generally comprises hemp fibers. Fiber papers having a weight of 13 g, 15 g, 17 g, 19 g, 21 g, 23.7 g and 25.4 g per square meter are conventionally used. The contents of the regenerated cellulose and of the softener remain relatively constant. Thus the cellulose hydrate constant is generally 40 to 55 g/m^2 and the glycerol content is 15 to

30 g/m^2. The food casings additionally contain about 8 to 10% by weight of water, based on their total weight, which - depending on the diameter - is about 75 to 105 g/m^2. They are opaque, so that their contents cannot be discerned, and additionally stiff, which hinders fabrication and processing.

One potential method of solving these problems is to use lighter fiber paper. Thus, WO 91/09530 (= EP-B 0 460 410) discloses a tubular cellulose-hydrate-based food casing which is reinforced by a long-fibered manilla fiber paper having a weight of no more than 15 g/m^2 (in the air-dried state).

The use of thinner paper with a constant amount of viscose is relatively cost-intensive. A reduction in the viscose solution with a constant fiber-paper weight to improve the transparency, however, leads to greatly decreased strength.

The object was therefore to provide a fiber-reinforced, transparent, cellulose-hydrate-based food casing which is more pliable than the known casings and additionally is cheaper to produce.

The object is achieved by a fiber-reinforced, tubular food casing based on regenerated cellulose, which is produced using an amount of viscose solution which is decreased by 10 to 30% in comparison with the standard at a spinning speed increased by at least 25%. The amount of viscose is preferably reduced by 15 to 25%. The spinning speed is preferably increased by 25 to 60%. Absolute values of the spinning speed may only be given with difficulty, since the optimum speed varies with the type of spinning machine.

At the elevated spinning speed, no change in the composition of the spinning and precipitation baths is necessary. In contrast, at "standard speed" and with a simul-

taneously decreased amount of viscose solution, a fundamental change in the composition of the spinning and precipitation baths is necessary.

With a decreasing amount of viscose applied, a greater or lesser decrease in the mechanical strength of the food casings was actually to be expected. Surprisingly, however, precisely the opposite was found. Thus, the food casings of the invention withstood a 5 to 20% higher internal pressure before they burst than those produced with the "usual" amount of viscose solution (with an identical fiber-paper weight in each case). An electron microscopic study showed that in the case of the food casings of the invention, the proportion of "dense" cellulose hydrate zones had increased. These dense zones on the inside and outside primarily determine the mechanical strength of the casing. The increase is related to the decrease in the "loose" cellulose hydrate zone in the interior of the casing.

The food casings of the invention are preferably produced using a fiber paper having a weight of at least 17 g/m^2, particularly preferably 17 to 25.4 g/m^2. The fiber paper preferably comprises hemp fibers. The casings are outer- or double-viscosed.

The food casings of the invention can contain additional polymeric compounds which do not form gas in the regeneration. These are preferably cellulose-like (EP-A 0 460 348). Such compounds which are miscible with viscose solution are, e.g., alginates or high-molecular-weight copolymers which predominantly contain vinyl pyrrolidone units (®Gafquat 755N). These polymers not only control the regeneration, but also further serve as primary (= remaining in the casing on soaking) softeners, so that a secondary (= removable from the casing by soaking) softener, such as glycerol, can be dispensed with. The content of additional polymeric compound is

about 5 to 20% by weight, based on the weight of the dry cellulose.

The food casings of the invention can additionally be given a conventional internal impregnation, e.g. of casein/glyoxal.

In comparison with the standard casings, the weight of the food casings of the invention containing glycerol is about 10 to 15% lower and without glycerol is about 15 to 25% lower.

Owing to the decreased wall thickness, particularly long casing sections may be gathered to form "caterpillars", so that still more expedient processing is possible. The casings of the invention may be filled in the soaked or unsoaked state.

The food casings of the invention are used particularly as sausage casings, especially for rapidly-ripened long-keeping sausage types (e.g. "Bergsteigerwurst" or "Rauchbunkerl", an Austrian speciality) and for smoked scalded-emulsion sausage types. Owing to the decreased wall thickness, the casing of the invention shows higher permeation (water permeability under pressure). In the case of standard casings, the permeation at an internal pressure of 40 bar is about 90 to 110 l of water per square meter and per day, and those of the invention, in contrast, 20 to 40% greater.

In the production of long-keeping sausage, drying after filling proceeds particularly rapidly. In the case of rapidly ripened long-keeping sausage types, an addition of gluconodeltalactone (GDL) effects a more rapid coagulation, which demands more rapid release of water. Transparency is good, so that the sausage emulsion surface is clearly visible.

Finally, the thinner fiber casings are particularly rapidly biodegradable and thus highly compostible.

The following examples describe the invention. The data of the standard casings and of the novel casings are compared in Tables 1 to 3.

Example 1

A 17 g hemp fiber paper was formed into a tube having a diameter of 68 mm (= caliber 68) and was outer-viscosed. The amount of viscose solution was below that conventionally used by 15% by weight. The tubular casing thus coated was conducted at a speed 30% above the standard speed through the conventional spinning, precipitation, washing and softener vats. Before drying, the tube was then further impregnated from the inside with an aqueous solution which contained casein and glyoxal. The casing dried in the inflated state was then gathered (shirred). Each caterpillar comprised 50 m of the casing. During filling on a filling and clipping automat (type FCA from Niedecker GmbH, Frankfurt/M.), there were no breakdowns. The filling caliber varied between 73.5 and 75 mm. On ripening, the sausages were dried off after a 10 to 15% shorter time. Their appearance was very good. The peelability after a storage time of 2 weeks was rated as "2" (= normal; subjective rating scale from 1 = "very easy" to 6 = "unsatisfactory").

Table 1

Characteristics	Comparison 68 caliber FDI standard	Invention 68 caliber FDI/light	Difference in %
Weight, g/m^2	84	74.0	-12.0
Glycerol, % by weight	23	22.3	- 3.1
Bursting pressure, kPa	71	78	+10.0
Test caliber in mm at 21 kPa	71.9-74.9 ø 73.4	73.8	+ 0.5
Water imbibition, %	130	137.2	+ 5.5
Permeation, $l/m^2 \cdot d$ at 40 bar	100	115	+ 15.0

Example 2

A 17 g hemp fiber paper was formed into a tube of caliber 48 and coated on the outside with viscose. The viscose solution used for this contained 10% by weight of a 4% strength aqueous sodium alginate solution. The content of alginate in the finished casing was about 5% by weight, based on the weight of the (dry) cellulose. For coating, an amount of viscose solution decreased by 15% by weight in comparison with the standard was used. The tube was drawn through the conventional baths (see Example 1) at a speed 47% higher than the standard, then internally impregnated, dried in the inflated state, then pressed flat and wound up. Pieces each of 50 m in length were shirred to form a caterpillar. On filling on said filling and clipping automat, there were no breakdowns. The filling caliber was 48 to 49.5 mm. The course of ripening was normal. The appearances of the sausages was very good. The peelability was rated "2".

Table 2

Characteristics	Comparison 48 caliber FDI standard	Invention 48 caliber FDI/light	Difference in %
Weight, g/m^2	84	70	-16.6
Glycerol, % by weight	23	22.3	- 3.1
Bursting pressure, kPa	89	102.4	+15.0
Test caliber in mm at 21 kPa	52.4-54.4 ø 53.4	53.4	± 0
Water imbibition, %	130	151	+16.0
Permeation, $l/m^2 \cdot d$ at 40 bar	100	113	+ 13.0

Example 3

A 19 g hemp fiber paper was formed into a tube of caliber 70 and coated from the outside with a mixture of

197.0 l of viscose solution,
14.7 l of 4% strength aqueous sodium alginate solution,
1.65 l of 50% strength by weight aqueous calcium stearate dispersion and
2.7 l of 10% strength by weight aqueous N-vinylpyrrolidone copolymer solution (®Gafquat 755N)

The finished casing contained, based on the weight of the dry cellulose, 5% by weight of alginate, 6% by weight of calcium stearate and 2% by weight of the N-vinylpyrrolidone copolymer. An amount of coating solution 20% by weight less than the standard was used for coating. The coated tube was drawn through the conventional baths at a speed 55% higher than the standard. Sections each of 70 m in length were shirred to form a caterpillar. The behavior on filling on said filling and clipping automat

was normal. Breakdowns were not observed. The course of ripening and peelability were good.

Table 3

Characteristics	Comparison 70 caliber FDI standard	Invention 70 caliber FDI/modified	Difference in %
Weight, g/m^2	84	68	-20.0
Glycerol, % by weight	22	0	
Bursting pressure, kPa	68	76.2	+12.0
Test caliber in mm at 21 kPa	74.6-77.6 ⌀ 76.1	76.4	+ 0.4
Water imbibition, %	130	120	- 7.7
Permeation, $l/m^2 \cdot d$ at 40 bar	100	83	- 17.0

Patent claims

1. A fiber-reinforced, tubular food casing based on regenerated cellulose, which is produced using an amount of viscose solution which is decreased by 10 to 30% in comparison with the standard at a spinning speed increased by at least 25%.

2. The food casing as claimed in claim 1, wherein the amount of viscose is reduced by 15 to 25%.

3. The food casing as claimed in claim 1 or 2, wherein the spinning speed is increased by 25 to 60%.

4. Food casing as claimed in claim 1, wherein it is produced using a fiber paper having a weight of at least 17 g/m^2, preferably 17 to 25.4 g/m^2.

5. The food casing as claimed in claim 4, wherein the fiber paper comprises hemp fibers.

6. The food casing as claimed in one or more of claims 1 to 5, wherein it is outer- or double-viscosed.

7. The food casing as claimed in one or more of claims 1 to 6, wherein it contains additional polymeric compounds which do not form gas in the regeneration.

8. The food casing as claimed in one or more of claims 1 to 7, wherein the content of additional polymeric compounds is about 5 to 20% by weight, based on the weight of the dry cellulose.

9. The food casing as claimed in one or more of claims 1 to 8, wherein it contains glycerol as secondary softener.

10. The food casing as claimed in one or more of claims 1 to 9, wherein the weight of the glycerol-containing food casings is lower than that of the corre-

sponding standard casings by about 10 to 15%, and that of the glycerol-free casings by about 15 to 25%.

11. The food casing as claimed in one or more of claims 1 to 10, wherein it has a conventional internal impregnation.

12. Use of the food casing as claimed in one or more of claims 1 to 11 as a synthetic sausage casing.

Abstract:

Fiber-reinforced cellulose-hydrate-based food casing produced with a decreased amount of viscose.

The invention relates to a fiber-reinforced, tubular food casing based on regenerated cellulose, which is produced using an amount of viscose solution which is decreased by 10 to 30% in comparison with the standard at a spinning speed increased by at least 25%.